

and sprinklers in a portion of the other fernery had not been closed. All of this fernery was equipped with oil heaters for frost protection and when the lighting of the heaters was begun, it was discovered that some sprinklers were operating. At that time, ice was just beginning to appear on the wet ferns. The sprinklers were turned off immediately and the heaters were lighted and burned throughout the period of damaging temperature. A few days after the cold spell, in the section where the irrigation had operated before heaters were lighted the ferns were a total loss for a space of about 12 feet around each sprinkler. In the spaces between sprinklers where the ferns had not been wet the damage was about 20 percent. The remainder of the fernery, which received no irrigation, also had damage of about 20 percent which was due to delay in getting the heaters lighted. According to this it appears that once spraying is begun it must be continued without interruption during the period of damaging cold.

In the cold spell of January 27, 28, and 29 the same method of protection was again used in the 4-acre plot of the Peerless fernery. At this time there was a good crop of ferns throughout most of the plot. On the morning of January 27, the temperature in the outside station reached  $26.3^{\circ}$  F. with  $3\frac{1}{4}$  hours at  $32^{\circ}$  and lower. On the morning of January 28, the temperature reached  $26.5^{\circ}$  F., with 4 hours at  $32^{\circ}$  and lower, and on the morning of January 29, it reached  $26.3^{\circ}$  F., with  $11\frac{1}{4}$  hours at  $32^{\circ}$  and lower. On each morning the sprinklers were started just before the temperature inside the fernery reached  $32^{\circ}$  and were continued into the next day without interruption, until all the ice had melted.

The fernery was again examined for frost damage a few days after the cold spell had ended. Damage again was confined to the unsprinkled area about halfway between

sprinklers; the loss here was 75 to 100 percent. Around each sprinkler for a radius of about 12 feet it was difficult to find a frond which showed any sign of damage.

The operating expense was very small. The equipment had been installed for the purpose of irrigating during dry weather, and the cost for upkeep and depreciation could be divided for this reason. The principal item of expense was for electric power to operate the pumps, which was figured to be less than \$1 per hour for the 4-acre plot. With additional sprinklers per acre the cost would have been very slightly higher.

The manager of the Peerless fernery, Hibbard Casselberry, states that he has practiced sprinkler frost protection with success in different ferneries at different times. He states that his only difficulty with this type of frost protection has been due to power failure, since a break-down while the ferns are covered with ice usually results in a complete loss of the crop. In his opinion, the type of soil is also important, and the method is better adapted to sandy soil of thirsty nature. In heavy soils, the large amount of irrigation water which is sometimes required might do considerable damage to the plants.

Attempt is not made to draw any sweeping conclusions from the results of this experiment since a much greater amount of data should be accumulated before generalizations are made. The facts brought out may be taken to indicate the reasonable possibility that frost damage to low-growing, tough, woody plants may be prevented at moderate cost by means of sprinkler irrigation properly managed, especially in the case of ferns which apparently suffer no harm from being coated with ice, provided the temperature of the ice is maintained at  $32^{\circ}$  by continuous spraying.

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